In-Depth

Overview

Points To Remember About Knee Problems

- Knee problems may be caused by injury, arthritis, or other diseases.
- Men, women, and children can have knee problems. They occur in people of all races and ethnic backgrounds.
- The symptoms of your knee problem depend on the type of injury or disorder. However, most knee problems cause pain and may limit your ability to move your knee.
- Doctors diagnose knee problems by taking a medical history, performing a physical examination, and ordering tests.
- Treatment of knee problems depends on the type of injury or condition.
- Some knee problems, such as those resulting from an accident, can’t be prevented. However, you can prevent some knee problems.
- When living with knee problems, everyone should get range of motion, strength, and aerobic exercise regularly.

Knee problems happen when you injure or develop disease in your knee and it can’t do its job. Your knee is the joint where the bones of the upper leg meet the bones of the lower leg, allowing hinge-like movement while providing stability and strength to support the weight of your body. Flexibility, strength, and stability are needed for standing and for motions like walking, running, crouching, jumping, and turning.

What are joints?

The point at which two or more bones are connected is called a joint. Several kinds of supporting and moving parts, including bones, cartilage, muscles, ligaments, and tendons, help the knees do their job.

In all joints your:

- Bones are kept from grinding against each other by a lining called cartilage.
- Bones are joined to bones by strong, elastic bands of tissue called ligaments.
- Muscles are connected to bones by tough cords of tissue called tendons. Muscles pull on tendons to move joints.

Although muscles are not technically part of a joint, they're important because strong muscles help support and protect your joints.

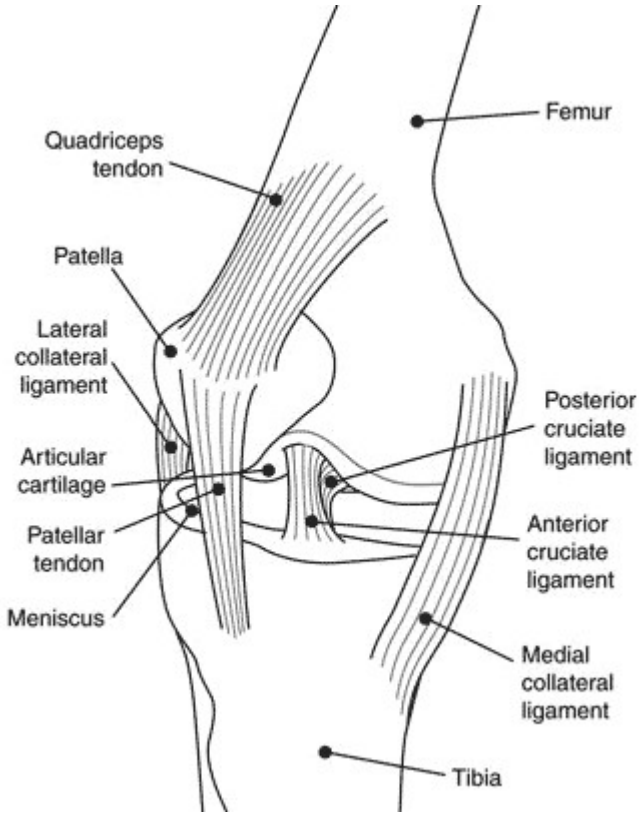
Each of these structures is subject to disease and injury. When a knee problem affects your ability to do things, it can have a big impact on your life. Knee problems can interfere with many things, from participation in sports to simply getting up from a chair and walking.

What are the parts of the knee?

Like any joint, the knee is composed of:

- Bones.
- Cartilage.
- Ligaments.
- Tendons.
- Muscles.

Take a closer look at the different parts of the knee in the illustration below.



Lateral view of the knee.

Bones and Cartilage

The knee joint is the junction of three bones:

- The femur, also known as the thigh bone or upper leg bone.
- The tibia, also known as the shin bone or larger bone of the lower leg.
- The patella or kneecap. The patella is 2 to 3 inches wide and 3 to 4 inches long. It sits over the other bones at the front of the knee joint and slides when the knee moves. It protects the knee and gives leverage to muscles.

The cartilage in the knee joint includes:

- Articular cartilage, a tough elastic material that covers the ends of the three bones in the knee joint. Articular cartilage helps absorb shock and allows the knee joint to move smoothly.
- Menisci, two crescent-shaped discs of connective tissue that separate the bones of the knee. They are between the tibia and femur, on the outer and inner sides of each knee. The two menisci in each knee act as shock absorbers, cushioning the lower part of the leg from the weight of the rest of the body as well as enhancing stability.

Muscles

There are two groups of muscles at the knee.

- The four quadriceps muscles on the front of the thigh work to straighten the knee from a bent position.
- The hamstring muscles, which run along the back of the thigh from the hip to just below the knee, help to bend the knee.

Tendons and Ligaments

The quadriceps tendon connects the quadriceps muscle to the patella (the kneecap) and provides the power to straighten the knee. The following four ligaments connect the femur and tibia and give the joint strength and stability:

- The medial collateral ligament, which runs along the inside of the knee joint, provides stability to the inner (medial) part of the knee.
- The lateral collateral ligament, which runs along the outside of the knee joint, provides stability to the outer (lateral) part of the knee.
- The anterior cruciate ligament, in the center of the knee, limits rotation and the forward movement of the tibia.
- The posterior cruciate ligament, also in the center of the knee, limits backward movement of the tibia.

The knee capsule is a protective, fiber-like structure that wraps around the knee joint. Inside the capsule, the joint is lined with a thin, soft tissue called synovium.

Types

The type of knee problem you have depends on the what part of the knee is injured or affected by disease.

Arthritis

There are some 100 different forms of arthritis, rheumatic diseases, and related conditions. Virtually all of them have the potential to affect the knees in some way; however, the following are the most common.

- Osteoarthritis is a form of arthritis. In this disease, your cartilage gradually wears away and changes occur in the adjacent bone. Osteoarthritis may be caused by joint injury or being overweight. It is associated with aging and most typically begins in people age 50 or older. A young person who develops osteoarthritis typically has had an injury to the knee or may have an inherited form of the disease.
- Rheumatoid arthritis, which generally affects people at a younger age than does osteoarthritis, is an autoimmune disease. This means it happens because your immune system attacks areas of your body. In rheumatoid arthritis, the primary site of the immune system's attack is your synovium, the membrane that lines the joint. This attack causes inflammation of your joint. It can lead to destruction of your cartilage and bone and, in some cases, muscles, tendons, and ligaments as well.
- Other rheumatic diseases, such as:
    - Gout. An acute and intensely painful form of arthritis that occurs when crystals of the bodily waste product uric acid are deposited in the joints.
    - Systemic lupus erythematosus (lupus). An autoimmune disease characterized by destructive inflammation of the skin, internal organs, and other body systems, as well as the joints.
    - Ankylosing spondylitis. An inflammatory form of arthritis that primarily affects the spine, leading to stiffening and in some cases fusing into a stooped position.
    - Psoriatic arthritis. A condition in which inflamed joints produce symptoms of arthritis for patients who have or will develop psoriasis.
    - Reactive arthritis. A term describing forms of arthritis that are caused by infectious agents, such as bacteria or viruses. Prompt medical attention is essential to treat the infection and minimize damage to joints, particularly if fever is present.

Chondromalacia

Chondromalacia, also called chondromalacia patellae, refers to softening and breakdown of the articular cartilage of the kneecap. This disorder happens most often in young adults and can be caused by:

- Injury.
- Overuse.
- Misalignment of the patella.

- Muscle weakness.

Instead of gliding smoothly across the lower end of the thigh bone, the kneecap rubs against it, roughening the cartilage underneath the kneecap. The damage may range from a slightly abnormal surface of the cartilage to a surface that has been worn away to the bone. Chondromalacia injury happens when a blow to the kneecap tears off either a small piece of cartilage or a large fragment containing a piece of bone, known as osteochondral fracture.

Meniscal Injuries

The menisci can be easily injured by the force of rotating the knee while bearing weight. A partial or total tear may occur when a person quickly twists or rotates the upper leg while the foot stays still. For example, when dribbling a basketball around an opponent or turning to hit a tennis ball. If the tear is tiny, the meniscus stays connected to the front and back of the knee; if the tear is large, the meniscus may be left hanging by a thread of cartilage. The seriousness of a tear depends on its location and extent.

Cruciate Ligament Injuries

Cruciate ligament injuries are sometimes referred to as sprains. They don’t necessarily cause pain, but they are disabling. The anterior cruciate ligament is most often stretched, torn, or both by a sudden twisting motion. For example, when the feet are planted one way and the knees are turned another. The posterior cruciate ligament is most often injured by a direct impact, such as in an automobile accident or football tackle.

Medial and Lateral Collateral Ligament Injuries

The medial collateral ligament is more easily injured than the lateral collateral ligament. The cause of collateral ligament injuries is most often a blow to the outer side of the knee that stretches and tears the ligament on the inner side of the knee. Such blows frequently occur in contact sports such as football or hockey.

Tendon Injuries

Knee tendon injuries range from tendinitis, which is inflammation of a tendon to a ruptured or torn tendon. If a person overuses a tendon, it can stretch and become inflamed. This can happen during activities such as:

- Dancing.
- Cycling.
- Running.

Tendinitis of the patellar tendon is sometimes called “jumper’s knee” because in sports that require jumping, such as basketball, the muscle contraction and force of hitting the ground after a jump strain the tendon. After repeated stress, the tendon may become inflamed or tear.

Osgood-Schlatter Disease

Osgood-Schlatter disease is a condition caused by repetitive stress or tension on part of the

growth area of the upper tibia (the apophysis). It is characterized by inflammation of the patellar tendon and surrounding soft tissues at the point where the tendon attaches to the tibia. The disease may also be associated with an injury in which the tendon is stretched so much that it tears away from the tibia and takes a fragment of bone with it. The disease most commonly affects active young people, particularly boys between the ages of 10 and 15, who play games or sports that include frequent running and jumping.

Iliotibial Band Syndrome

Iliotibial band syndrome is an inflammatory condition caused when a band of tissue rubs over the lateral condyle, or outer bone, of the knee. Although iliotibial band syndrome may be caused by direct injury to the knee, it is most often caused by the stress of long-term overuse, such as what sometimes occurs in sports training and, particularly, in running.

Osteochondritis Dissecans

Osteochondritis dissecans results from a loss of the blood supply to an area of bone underneath a joint surface and usually involves the knee. The affected bone and its covering of cartilage gradually loosen and cause pain. This problem usually arises spontaneously in an active adolescent or young adult. It may be caused by a slight blockage of a small artery or to an unrecognized injury or tiny fracture that damages the overlying cartilage. A person with this condition may eventually develop osteoarthritis.

Lack of a blood supply can cause bone to break down, known as osteonecrosis. The involvement of several joints or the appearance of osteochondritis dissecans in several family members may indicate that the disorder is inherited.

Plica Syndrome

Plica syndrome occurs when plicae, the bands of synovial tissue, are irritated by overuse or injury. Synovial plicae are the remains of tissue pouches found in the early stages of fetal development. As the fetus develops, these pouches normally combine to form one large synovial cavity. If this process is incomplete, plicae remain as four folds or bands of synovial tissue within the knee. Injury, chronic overuse, or inflammatory conditions are associated with this syndrome.

Symptoms

The symptoms of your knee problem depend on the type of injury or disorder.

Arthritis

The symptoms of osteoarthritis in the knee are:

- Pain.
- Stiffness.

The symptoms of rheumatoid arthritis and gout in the knee can include:

- Pain.
- Stiffness.
- Swelling.
- Redness.
- Hot to the touch.

Chondromalacia

The most frequent symptom of chondromalacia is a dull pain around or under the kneecap that worsens when walking down stairs or hills. A person may also feel pain when climbing stairs or when the knee bears weight as it straightens.

Meniscal Injuries

Symptoms of meniscus injuries include:

- Pain, particularly when the knee is straightened.
- Swelling.
- Clicking sound in the knee.
- Locking of the knee joint.
- Weakness.

Sometimes if you injure your knee, but did not seek treatment, you can develop symptoms months or years later. Although symptoms of meniscal injury may disappear on their own, they frequently persist or return and require treatment.

Cruciate Ligament Injuries

The symptoms for cruciate ligament injuries may include:

- Hearing a popping sound
- Buckling of the leg when you try to stand on it.

Medial and Lateral Collateral Ligament Injuries

The symptoms for medial and lateral collateral ligament injuries may include:

- Feeling a pop and the knee may buckle sideways.
- Pain.
- Swelling.

Tendon Injuries

The symptoms for tendon injury or disorder can include:

- Pain.

- Inflammation.
- Swelling

Osgood-Schlatter Disease

The symptoms of Osgood-Schlatter disease are usually:

- Pain below the knee that usually worsens with activity and is relieved by rest.
- A bony bump below the knee cap that is painful when pressed.

Iliotibial Band Syndrome

The symptoms of iliotibial band syndrome can include:

- Pain at the side of the knee, which can travel up the side of the thigh.
- Feeling a snap when the leg is bent and then straightened.
- An ache or burning sensation at the side of the knee during activity.

Osteochondritis Dissecans

The symptoms of osteochondritis dissecans can include:

- Pain, which may be sharp if the cartilage breaks off.
- Weakness.
- Locking knee joint.

Plica Syndrome

The symptoms of plica syndrome can include:

- Pain.
- Swelling.
- Clicking sensation in the knee
- Weakness
- Locking of the knee joint.

Diagnosis

Doctors diagnose knee problems based on the findings of a medical history, physical exam, and diagnostic tests.

Medical History

During the medical history, the doctor asks how long symptoms have been present and what problems you are having using your knee. In addition, the doctor will ask about any injury, condition, or health problem that might be causing the problem.

Physical Examination

The doctor bends, straightens, rotates (turns), or presses on the knee to feel for injury and to determine how well the knee moves and where the pain is located. The doctor may ask you to stand, walk, or squat to help assess the knee's function.

Diagnostic Tests

Depending on the findings of the medical history and physical exam, the doctor may use one or more tests to determine the nature of a knee problem. Some of the more commonly used tests include:

- X-ray (radiography). A procedure in which an x-ray beam is passed through your knee to produce a two-dimensional picture of your bones.
- Computerized axial tomography (CT) scan. A painless procedure in which x-rays are passed through your knee at different angles, detected by a scanner, and analyzed by a computer. CT scan images show soft tissues such as ligaments or muscles more clearly than do conventional x-rays. The computer can combine individual images to give a three-dimensional view of your knee.
- Ultrasound. A technique that uses sound waves to produce images of the soft tissue structures within and around your knee. A small, hand-held scanner is placed on and around the skin of the knee, which may be moved into different positions throughout the exam.
- Magnetic resonance imaging (MRI). A procedure that uses a powerful magnet linked to a computer to create pictures of areas inside your knee. During the procedure, your leg is placed in a cylindrical chamber where energy from a powerful magnet (rather than x-rays) is passed through your knee. An MRI is particularly useful for detecting soft tissue damage.
- Arthroscopy. A surgical technique in which the doctor manipulates a small, lighted optic tube (arthroscope) that has been inserted into the joint through a small incision in your knee. Images of the inside of the knee joint are projected onto a television screen.
- Joint aspiration. A procedure that a doctor performs by removing fluid buildup in your joint to reduce swelling and relieve pressure. A laboratory analysis of the fluid can determine the presence of a fracture, an infection, or an inflammatory response.
- Biopsy. A procedure in which tissue is removed from your body and studied under a microscope.

Treatment

The treatment of knee problems depends on your type of injury or condition.

Arthritis in Knees

The most common type of arthritis of the knee is osteoarthritis. In this disease, the cartilage in your knee gradually wears away. Treatments for osteoarthritis are:

- Medicines to reduce pain, such as aspirin and acetaminophen.
- Medicines to reduce swelling and inflammation, such as ibuprofen and nonsteroidal anti-inflammatory drugs (NSAIDs).
- Injections of corticosteroids medications directly into the knee joint.
- Exercises to improve movement and strength.
- Weight loss to relieve the stress on the knee joint.

Rheumatoid arthritis is another type of arthritis that affects the knee. In rheumatoid arthritis, your knee becomes inflamed and cartilage may be destroyed. Treatment includes:

- Physical therapy to strengthen the muscles.
- Weight loss to relieve the stress on the knee joint.
- Medicines similar to those prescribed for osteoarthritis. However, you may need additional medicines such as disease-modifying, anti-rheumatic drugs or biologic response modifiers to control the disease.
- Knee for a seriously knee damage, which can include:
    - Knee replacement.
    - Cartilage replacement.
    - Resurfacing the damaged cartilage.

Treatment for other joint diseases is similar to the treatment for rheumatoid arthritis.

Chondromalacia

To treat chondromalacia, many doctors recommend that people with chondromalacia perform low-impact exercises such as:

- Swimming.
- Riding a stationary bicycle.
- Using a cross-country ski machine.

These types of exercises strengthen muscles, particularly muscles of the inner part of the quadriceps, without injuring joints. If these treatments don’t improve the condition, surgery may be indicated.

Injuries to the Menisci

If the tear is minor and the pain and other symptoms go away, the doctor may recommend a muscle-strengthening program. The following exercises are designed to build up the quadriceps and hamstring muscles and increase flexibility and strength after injury to the meniscus:

- Warming up the joint by riding a stationary bicycle, then straightening and raising the leg (but not straightening it too much).
- Extending the leg while sitting (a weight may be worn on the ankle for this exercise).
- Raising the leg while lying on the stomach.
- Exercising in a pool (walking as fast as possible in chest-deep water, performing small flutter kicks while holding onto the side of the pool, and raising each leg to 90 degrees in chest-deep water while pressing the back against the side of the pool).

Before beginning any type of exercise program, consult your doctor or physical therapist to learn which exercises are appropriate for you and how to do them correctly. If you are doing the wrong exercise or exercising improperly, you can cause problems. A health care professional can also advise you on how to warm up safely and when to avoid exercising a joint affected by arthritis.

If your lifestyle is limited by the symptoms or the problem, surgery may be indicated.

Cruciate Ligament Injuries

For an incomplete tear, your doctor may recommend an exercise program to strengthen surrounding muscles. He or she may also prescribe a brace to protect the knee during activity. For a completely torn anterior cruciate ligament in an active athlete and motivated person, your doctor is likely to recommend surgery.

Medial and Lateral Collateral Ligament Injuries

Most sprains of the collateral ligaments will heal if you:

- Follow a prescribed exercise program.
- Apply ice packs to reduce pain and swelling.
- Use a small sleeve-type brace to protect and stabilize the knee.

A sprain may take 2 to 4 weeks to heal. A severely sprained or torn collateral ligament may be accompanied by a torn anterior cruciate ligament, which usually requires surgical repair.

Tendon Injuries and Disorders

Treatment for tendon injuries and disorders includes:

- Rest.
- Ice.
- Elevation.
- Medicines such as aspirin or ibuprofen to relieve pain and reduce swelling.
- Limiting sports activity.
- Exercise for stretching and strengthening.
- A cast, if there is a partial tear.
- Surgery for complete tears or very severe injuries.

The goals of an exercise program for tendon injuries and disorder are:

- Restore the ability to bend and straighten the knee.
- Strengthen the knee to prevent repeat injury.

Osgood-Schaltter Disease

Osgood-Schlatter disease is temporary and the pain usually goes away without treatment, which includes:

- Applying ice to the knee when pain begins to help relieve inflammation.
- Stretching and strengthening exercises.
- Limiting participation in vigorous sports.
- Wearing knee pads for protection and apply ice to the knee after more intense activity.

If there is a great deal of pain, sports activities may be limited until the discomfort becomes tolerable.

Iliotibial Band Syndrome

Iliotibial band syndrome usually disappears if you:

- Reduce your activity.
- Perform stretching exercises followed by muscle-strengthening exercises.

In rare cases when the syndrome doesn't disappear, you may need surgery to split the tendon so it isn't stretched too tightly over the bone.

Osteochondritis Dissecans

Doctors treat osteochondritis dissecans with:

- Rest and limiting activity.
- Physical therapy.

If conservative measures do not help or the cartilage fragments are loose, surgery may be recommended. Surgery can include:

- A surgeon placing a pin or screw. This can stimulate new blood flow to the cartilage.
- A surgeon may scrape the cavity to reach fresh bone and add a bone graft to fix the fragments in position.
- Research is being done to investigate cartilage and tissue transplants.

Plica Syndrome

The treatments for plica syndrome include:

- Medicines such as aspirin or ibuprofen to reduce swelling.
- Rest.
- Ice.
- Elastic bandage on the knee.
- Exercises to strengthen muscles.
- Cortisone injection into the plicae.

You may need surgery to remove the plica if the other treatments do not fix the problem.

Who Treats

After an examination by your primary care doctor, he or she may refer you for evaluation by:

- Rheumatologist, a doctor who specializes in nonsurgical treatment of arthritis and other rheumatic diseases.
- Orthopaedic surgeon or orthopaedist, a doctor who specializes in *nonsurgical and surgical* treatment of bones, joints, and soft tissues such as ligaments, tendons, and muscles.
- Physiatrist, a doctor who specializes in physical medicine and rehabilitation to help you restore function to your muscles, bones, tissues, and nervous system.

Minor injuries or arthritis may be treated by an internist (a doctor trained to diagnose and treat nonsurgical diseases) or your primary care doctor.

Living With

When living with knee problems, everyone should get three types of exercise regularly:

- Range-of-motion exercises to help maintain normal joint movement and relieve stiffness.
- Strengthening exercises to help keep or increase muscle strength. Keeping muscles strong with exercises, such as walking up stairs, doing leg lifts or dips, or riding a stationary bicycle, helps support and protect the knee.
- Aerobic or endurance exercises to improve function of the heart and circulation and to help control weight. Weight control can be important if you have arthritis because extra weight puts pressure on many joints. Some studies show that aerobic exercise can reduce inflammation in some joints.

Your doctor or physical therapist can help you come up with a plan of exercise. This can help your knee(s) without increasing the risk of injury or further damage. As a general rule, you should choose gentle exercises such as:

- Swimming.
- Aquatic exercise.
- Walking.

You should avoid jarring exercises such as jogging or high-impact aerobics.

Prevention

Some knee problems, such as those resulting from an accident, can't be prevented. However, people can prevent many knee problems by doing the following:

- Before exercising or participating in sports, warm up by walking or riding a stationary bicycle, then do stretches. Stretching the muscles in the front of the thigh (quadriceps) and back of the thigh (hamstrings) reduces tension on the tendons and relieves pressure on the knee during activity.
- Strengthen the leg muscles by doing specific exercises (for example, by walking up stairs or hills or by riding a stationary bicycle). A supervised workout with weights is another way to strengthen the leg muscles that support the knee.
- Avoid sudden changes in the intensity of exercise. Increase the force or duration of activity gradually.
- Wear shoes that fit properly and are in good condition. This will help maintain balance and leg alignment when walking or running. Flat feet or over-pronated feet (feet that roll inward) can cause knee problems. People can often reduce some of these problems by wearing special shoe inserts (orthotics).
- Maintain a healthy weight to reduce stress on the knee. Obesity increases the risk of osteoarthritis of the knee.

Research Progress

Studies of the various forms of arthritis are helping doctors better understand these diseases and develop treatments to stop or slow their progression and damage to joints, including the knees.

Studies are also underway to discover or develop safer and more effective pain relief, particularly for osteoarthritis of the knee. In recent years, the nutritional supplement pair glucosamine and chondroitin has shown some potential for reducing the pain of osteoarthritis, although no conclusive proof has emerged to date. Both of these nutrients are found in small quantities in food and are components of normal cartilage.

The Glucosamine/Chondroitin Arthritis Intervention Trial (GAIT), which was cosponsored by the National Center for Complementary and Integrative Health (NCCIH) and the National Institute of Arthritis and Musculoskeletal and Skin Diseases, assessed the effectiveness and safety of these supplements, when taken together or separately.

The trial found that the combination of glucosamine and chondroitin sulfate did not provide significant relief from osteoarthritis pain among all participants. However, a smaller subgroup of study participants with moderate-to-severe pain showed significant relief with the combined supplements.

Studies involving imaging techniques, in combination with measurements of biochemical markers, could result in early identification of diseases affecting the knee. They could also increase the ability to predict disease progression and enable direct monitoring of responses to tissue repair and therapeutic interventions.

Other areas of research involve trying to understand better how and why joint injuries occur and the measures that should be taken to prevent them, investigating the role of exercise in protecting the knee, and developing less invasive surgeries and better joint prostheses.

Related Resources

U.S. Food and Drug Administration
Toll free: 888-INFO-FDA (888-463-6332)
Website: https://www.fda.gov

Drugs@FDA at https://www.accessdata.fda.gov/scripts/cder/daf. Drugs@FDA is a searchable catalog of FDA-approved drug products.

Centers for Disease Control and Prevention, National Center for Health Statistics
Website: https://www.cdc.gov/nchs

American Academy of Orthopaedic Surgeons
Website: https://www.aaos.org

American College of Rheumatology
Website: https://www.rheumatology.org

American Physical Therapy Association
Website: https://www.apta.org

Arthritis Foundation
Website: https://www.arthritis.org

If you need more information about available resources in your language or other languages, please visit our webpages below or contact the NIAMS Information Clearinghouse at NIAMSInfo@mail.nih.gov.

- Asian Language Health Information
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